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VIRTUAL CLASSROOMS FOR BIODIVERSITY CONSERVATION DISCOURSES: AN EXPLORATORY ANALYSIS

Ricardo T. Bagarinao
Associate Professor
Faculty of Education, University of the Philippines Open University
Los Baños, Laguna, Philippines
Tel: (+6349) 536-6001 to 6009 local 100
Mobile: (+63915) 823-0785
Email: ricardo.bagarinao@upou.edu.ph

Abstract - The rapid development in information and communication technology (ICT) paved the way for education institutions to develop virtual classrooms (VCs). Recently, VCs serve as alternative venues for learning and teaching transactions. This paper discusses the potential roles of VCs in biodiversity conservation discourses. The discussion is based on the author's experience as a faculty-in-charge in an online course in environmental and natural resources management program. Learners' data from 2003-2007 in one of the distance education and open universities in the Philippines were retrieved and analyzed. Three socio-demographic student variables were analyzed, namely, age, gender, and geographical location. Logged data were also analyzed, and three variables were used: frequency of visit, time of visit, and length of visit.

The minimum age of the students in the program is 18 years old while the maximum age is 66 years old. They represent four generations, and more than 60 provinces in the Philippines, and nearly 50 countries worldwide. Both male and female are nearly equally represented. These data indicate that VCs can potentially create a venue for intergenerational discourses on biodiversity conservation, develop multi-cultural perspective on the issues in biodiversity, broaden potential impact areas or application areas of environmental concepts, reduce gender bias, and disseminate timely environmental information to impact areas. These potentials may justify the use of VCs in disseminating information that is necessary for the conservation of biodiversity.

Keywords*: distance education, information and communication technology, virtual classrooms*

INTRODUCTION

Reviewing the current literature in Environmental Science and related fields will reveal a gloomy reality in relation to biodiversity. There are strong evidences that biodiversity has been destroyed at a global scale. For instance, Anuph Sha of Global Issues.org indicated that amphibian species are declining at an alarming rate. "Malcom MacCallum of the Biological Sciences Program, Texas A&M University calculated that the current extinction rate of amphibians could be 211 times the background amphibian extinction rate" (Sha 2011). Ocean biodiversity is also declining at a global scale (Sha 2011). The decline is due to overfishing. Unfortunately, several reports show that fishes are not the only victims of the destructive fishing strategies but also mammals, birds, and other creatures that are struggling to survive (Sha 2011). In the same report, Sha (2011) indicated that in the past century, commercial whaling has decimated numerous whale populations. Many of them have struggled to recover. In Faroe Island, around 950 Long-finned Pilot Whales (*Globicephala melaena*) are killed annually, mainly during the summer. Even endangered species such as fin whales are being killed with permit in Iceland (SSCS 2011). In addition, the Sea Shepherd Conservation Society (2011) reported that Japanese whaling fleet kills hundreds of whales each year in the Antarctic Whale Sanctuary and in the North Pacific.

The seas are the richest source of wild protein in the human diet (Common Dreams.org. 2002). It comes in the form of fish, mollusks (e.g. mussels) and crustaceans (e.g. shrimps), but over the past decade this supply has begun to dwindle. Over the past 50 years the world catch has grown fivefold but since the 1990s it has declined substantially despite increased efforts to find fresh stocks of

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fish. More than half of the world's main fisheries are suffering from overfishing.

On the other hand, the terrestrial ecosystems are not spared from destructive anthropogenic activities. The World Atlas of Biodiversity, which is produced and published by the United Nation indicates how anthropogenic activities have changed the Earth's surface, and how humans drive thousands of species to extinction (Common Dreams.org 2002). As indicated in the Atlas, humans have altered nearly 47% of the Earth's land surface over the past 150 years. If such rate will remain unabated and unmanaged, alteration will impact more than 80% of the land surface. The Atlas further indicates that "half of the area of forest that had developed since the last ice age has since been cleared or degraded by man, and that about 22 per cent of these areas are used for farming, towns and other kinds of human development" (Common Dreams.org 2002). The decline is especially prevalent today in the tropical rainforests of South-East Asia, the Congo and parts of the Amazon (Common Dreams.org 2002).

Seeing the value of biodiversity in improving human welfare, Mark Collins, the director of the United Nations Environment Programme World Conservation Monitoring Center in Cambridge, argues that conservation is no longer a luxury but essential to the quality of life (Common Dreams.org 2002). The gravity of the destruction of the world's biodiversity and other natural resources calls for immediate control and management of the various causes of the destruction. It further requires a continuation of the discourses in conservation initiatives and strategies so as to arrive at rational and workable compromises among stakeholders. These discourses should take place even in nontraditional or conventional venues.

The rapid advances in information and communication technology (ICT) such as the web or the internet can be harnessed to facilitate the discussion in biodiversity conservation. The capability of the internet to facilitate interactivity has actually paved the way for the development of virtual venues for both synchronous and asynchronous conversations. It has also encouraged the formulation and implementation of online environmental programs, which increase potentially the number of skilled and experts in biodiversity conservation and management.

Globally, there is an increasing number of educational institutions that offer environmental programs in the web. Statistics also show that the number of students enrolling in these online programs is increasing through time (Pope 2006).

The accessibility of the internet anywhere in the globe makes this technology a promising tool for the discourses in biodiversity conservation. For instance, the Miniwatts Marketing Group (2011) reported a global distribution of internet usage as of March 31, 2011. The number is remarkable especially for Asia, Europe, and America. In fact, the same report has shown that internet penetration has increased significantly from 2000 to 2011, with an estimated global growth of 480% (Miniwatts Marketing Group 2011).

These figures highlight the potential use of the internet as a medium for discussing issues and/or concerns in biodiversity; more so, the discussion in concepts or principles that may guide environmental and natural resource managers in coming up strategies and compromises for the sustainable development of these resources. Just as in the physical classrooms, discussion of these topics may be productive and dynamic. But unlike the former where the physical classroom has limited space, the discussion in the net may accommodate more participants than those in the traditional classroom due to the borderless characteristic of the net. In addition, multi-cultural interactions will be made possible since anyone in the globe once given the access can enter the virtual classroom.

This paper discusses the author's experience at the University of the Philippines Open University in administering online discourses in environmental and natural resources management. It highlights the potential roles of "virtual classroom" as venues for interactions on environmental issues, resources conservation, biodiversity protection, and the like. The analysis was based on a time series enrollment data from 2003-2007, and the logged data of online learners.

METHODOLOGY

The UP Open University

Established on 23 February 1995, the University of the Philippines - Open University (UPOU) pioneered in online teaching and learning and

continues to play a leading role in the study and practice of open learning and distance education in the Philippines. UPOU is the nation's most comprehensive distance education institution, with two undergraduate programs, nine post-baccalaureate certificate and diploma programs, 11 master's programs, two doctoral programs and 9 non-formal courses. It has a network of 10 learning centers and 19 testing centers in the country and abroad. This coupled with its ability to harness a wide range of digital technologies in education, have enabled the University to build a global community of both Filipinos and foreigners in more than 40 countries.

UPOU employs the distance education (DE) mode of teaching and learning. The key features of DE as practiced at UPOU are as follows (http://www2.upou.edu.ph/about-us):

"• Students and teachers are physically separated from each other. They do not meet face-to-face in a physical classroom.

• Students undertake guided independent study of carefully selected as well as specially designed learning materials in various media — print, video, and multimedia.

• Interaction between teachers and students, and among students, takes place through online tutorials in a virtual classroom. Other forms of communication between teacher and student are email, text, and teleconferencing.

• Final examinations are conducted either face-to-face at designated learning centers, or online. All examinations are proctored"

The study focused on one of its program, the Master in Environmental and Natural Resources Management (MENRM). The program is designed to give students a multi-disciplinary perspective and a solid foundation in the art and science of environment and natural resources management. The degree program aims to:

- equip students with a multidisciplinary perspective in dealing with environmental issues by providing solid grounding in both natural sciences and social sciences as these apply to environmental management; and
- enable students to become highly skilled and knowledgeable practitioners in either upland or coastal resources management.

All students will select from two program tracks - either the Upland or the Coastal Resources Management Tracks - upon completion of the two core courses. Students must complete 36 units of course work, divided into 6 units of core courses, 12 units of major courses, 9 units of electives, 6 units of research courses and 3 units of Special Problem course. All courses in the program are offered via the internet (www.upou.edu.ph). Figure 1 shows a sample course site (or virtual classroom) in one of its courses.

Figure 1. Sample virtual classroom

Logged and Enrollment Data Analysis and Identification of Potential Roles

In identifying the potential roles of the virtual classrooms, enrollment data from 2003-2007 were retrieved from the database and analyzed. Three learners' factors (i.e. geographical location, age, and gender) were predetermined, and used to categorize the learners. In terms of age, learners were categorized into four based on the generations represented in the program:

- Veterans (1922-1943)
- Baby Boomers (1943-1960s)
- Xers (1961-1980)
- Nexters (1981 and up)

Also, the logged data in UPOU's learning management system (LMS), *myportal.upou.edu.ph*, which is powered by Modular Object-Oriented Dynamic Learning Environment (MOODLE), were extracted and analyzed. A logged data reflect the date and time of access, the IP address, full name of user, action taken by the user, and information visited (Figure 2). The analysis started with data retrieval from the students' profile from the LMS. A total of 12,992 logged data were retrieved, and converted, manipulated, and analyzed through the data analysis tool kit of Excel program (Microsoft Office). Three connectivity variables (i.e. frequency of visit in the virtual classroom, time of visit, and length of visit) were identified. Aggregated values for these three variables were computed for each learner. These factors complemented the three learners' variables in the identification of the potential roles of virtual classrooms. The data were then fed into a geographic information system environment.

Data Analysis and Visualization

Descriptive statistics such as means, frequency, percentages, and the like were used in analyzing the data. Results of data processing were visualized as graphs, maps, and tables.

RESULTS AND DISCUSSION

Geographical Distribution of the Learners

The logged and enrollment data analyses of the program's students indicate that more than 70% are Filipinos that are dispersed in the various regions of the country though a greater percentage is located in Metro Manila areas and nearby provinces such as Laguna, Batangas, Cavite, and Quezon (Figure 3). More than 14%, however, are foreign or offshore students. They were distributed in nearly 47 countries including Indonesia, Hong Kong, Japan, Malaysia, United Arab Emirates, New Zealand, Yemen, Nigeria, and Canada (Table 1).

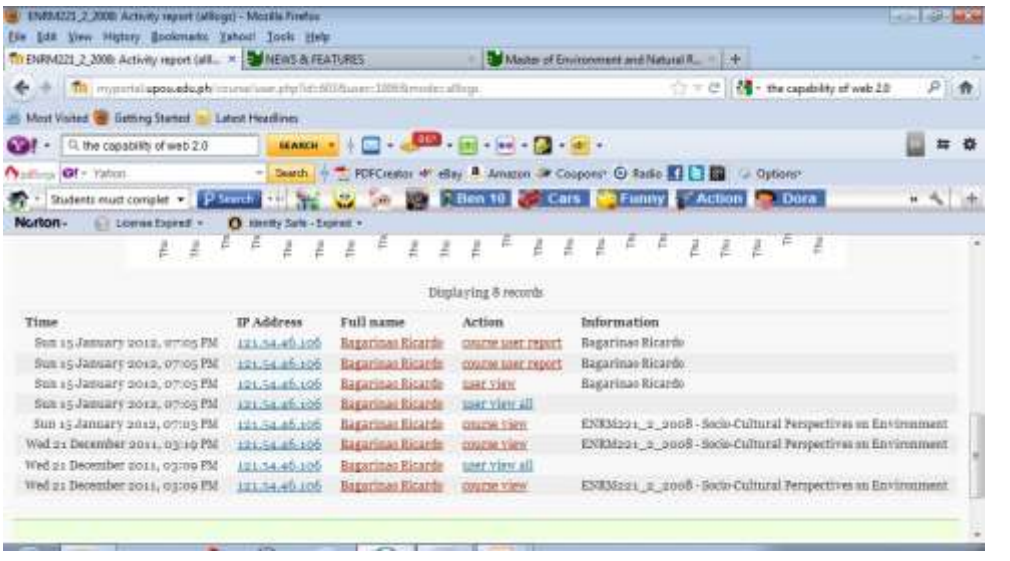

Figure 2. Sample logged data

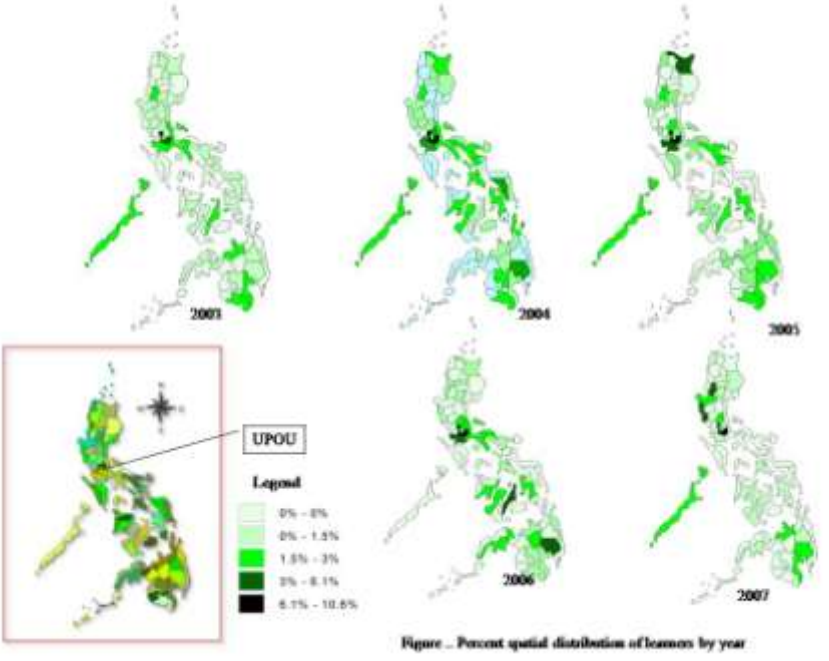

Figure .. Percent spatial distribution of learners by year

Table 1. Global distribution of students

COUNTRY	COUNT	COUNTRY	COUNT	COUNTRY	COUNT
Apo AE	1	Oman	1	Liberia	2
Australia	3	Pakistan	3	Libyan Arab Jamahiriya	1
Bahrain	5	Papua New Guinea	1	Malaysia	6
Brunei Darussalam	3	Qatar	6	Marshall Islands	1
Cambodia	4	Rwanda	3	Mauritius	1
Canada	2	Saudi Arabia	48	Mongolia	1
China	24	Singapore	11	Netherlands	1
Eritrea	1	Sudan	1	New Zealand	1
Ethiopia	4	Switzerland	1	Nigeria	1
Germany	3	T'Chand	1	TOTAL	314
Guam	1	Taiwan	1		
Hong Kong	1	Tajikistan	1		
Indonesia	9	Thailand	16		
Ireland	2	United Arab Emirates	50		
Italy	1	United States	31		
Japan	12	Vietnam	3		
Jordan	3	West Africa	2		
South Korea	11	Yemen	2		
Kuwait	6	No Data	19		
Lao People's Democratic Republic	2				

Distribution by Gender and Age

Figure 4 shows the distribution of learners by gender. As indicated in Figure 4, both male and female are generally equally represented. Though there is a decreasing trend in terms of registration, current data however shows an increase in both populations.

Minimum age of learners is 18 while maximum is 66. Age analysis of the student data reveals that four generations were represented in the student pool (Table 2). Though most of the students belong to the young generations, i.e. those who were born from 1961 and up, there were students who belong to the older generations. This is a

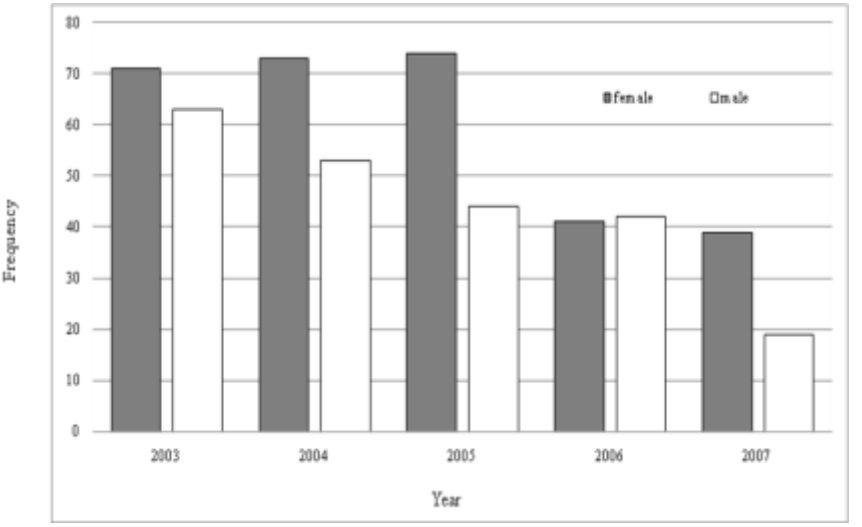

Figure 4. Gender distribution of learners

Table 2. Percent distribution of students by generation category by year

Generation Category	Percent/Year				
	2003	2004	2005	2006	2007
Veterans (1922-1943)	0	0	0	0.8	0
Baby Boomers (1943-1960s)	7	8	8	7	16
Xers (1961-1980)	48	68	62	76	78
Nexters (1981 and up)	45	24	31	16	6
Total	**100**	**100**	**100**	**100**	**100**

common scenario in an online program, which created opportunities for older individuals to pursue formal education without being affected by the psychological consequence of their age. With online learning, each individual is given an opportunity to become a lifelong learner.

Connectivity Patterns

The analysis of the learner's connectivity pattern reveals that students visit the virtual classroom more often than their counterparts in the residential mode. On the average, an online student visits his/her classroom for about 265 times, which is more than 7 times greater than the expected number of visits that a residential student should do in a semester for a 3-unit course (Table 3). Likewise, these learners spent an estimated 19.56 hours in the course site. Learners are more active during the night (mean tov_{night} = 3,366) than during the day (mean tov_{day} = 2,895), and spent more time at night (mean lov_{night} = 5.78 hrs) than on day (mean lov_{day} = 4.46 hrs). This result shows the capability of online programs to accommodate students' access regardless of time. It also provides opportunities for working individuals to attend their classes at their convenient time.

Potential Roles of Virtual Classrooms

Multi-cultural Perspective on Biodiversity Issues

The presence of the different nationalities in the University enrolling in its online programs makes virtual classrooms a good venue for a discussion that may result in the creation of a multi-cultural perspective or framework for biodiversity conservation. This is important since biodiversity conservation is not only a technical issue but also a cultural issue. And there are just several cultures that affect biodiversity. For instance, the killing of whales in Faroe Island is culturally-driven rather than commercially-driven; and this is different from the practices observed in Japan, Norway, and Iceland (SSCS 2011). Sauer (1965) argued that "cultures shape biodiversity through the direct selection of plants and animals." Unfortunately,

Table 3. Learner's Connectivity Pattern

Variables	Min	Max	Total	Mean
Number of visits	32	972	6,107	265.52
Number of visits at night	0	617	3366	146.35
Number of visits at day	7	355	2,741	125.87
Length of visit (hours)	0.15	59	450	19.56
Length per visit at night (hours)	0.01	1.34	5.78	0.25
Length per visit at day (hours)	0.02	0.54	4.46	0.19

there is diversity of the ways in selecting plants and animal species throughout the globe. To be able to arrive at a certain strategy for conservation, this diversity issue must be addressed and considered in the final formulation of the strategy. And this requires that all stakeholders with differing cultures must come to talk and reach at a compromise. The borderless characteristic of virtual classrooms may serve as the venue for this discussion. Unlike the physical classrooms, virtual classrooms can accommodate a large number of participants that may be located in different geographic areas in the globe. More than 15 cultures are usually represented in one virtual classroom in one semester of study. Interestingly, there is a hint of culturally-influenced stance in certain discussion forums that we do for our class.

Gender-Sensitive Strategy

Aside from being a venue for a multi-cultural discussion, virtual classrooms create an opportunity for the development of a gender-sensitive conservation strategy. As indicated by the equal distribution of female and male students in an online program, a decision and/or agreement made during a discussion is a by-product of exchanges of ideas from both genders. The physical absence of students during a discussion leads to an issue-based discourse in biodiversity conservation rather than personality-based. This means that students will just respond to the issue posted in the discussion forum instead of reacting to the person who raised such issue. In many cases, females are being intimidated by males in a discussion inside a physical classroom. But this can be avoided when the discussion occurs in a virtual classroom. This is necessary because exposing and understanding gender-differentiated biodiversity practices and knowledge of males and females enhances biodiversity conservation (UNEP, nd). For this reason, we need to provide a venue that can help "incorporate gender dimensions into our understanding of biodiversity and its conservation, sustainable use and the sharing of benefits" (UNEP nd).

Intergenerational Discussion for Conservation

The presence of different generations in virtual classrooms may potentially address intergenerational issues in biodiversity conservation. This is important since conservation policies will not only affect present generations but likewise the future generations. Also, the older generations with their vast experiences may provide some future directions to the young generations in relation to formulating conservation strategies and implementing conservation initiatives. As implicated by the data on age distribution, it is apparent that virtual classrooms may satisfy this consideration in conservation discourses. This can be attributed to the borderless property of the internet, where people of different ages can access it anytime, anywhere for as long as they are connected. The survey conducted by Pew Research Center in 2010 shows a significant change on internet use by age group. According to the survey result, the number has increased significantly within 9 years. Though most of the users belong to the young adult and adult groups, the data shows that the internet has penetrated rapidly across ages. This might be a good indication for the utility of the internet in forms of virtual classrooms to bring different generations and talk about the formulation of approaches and policies to curtail the current rate of biodiversity destructions.

Accessibility of Information

The results of the logged data analysis also show the potential role of virtual classrooms as secured repository of information where users can easily access when needed. Scientific information is necessary for decision-making process, legislating policies, and planning and monitoring activities. Gelpe and Tarlock (1974) argues that implementation of legislative strategy requires scientific information that sets the baseline standards that can be applied to specific resource users. Hence, access to this information is necessary to establish a standard and/or formulate legislations that are not at least based on inferences of incomplete scientific data (Gelpe and Tarlock, 1974). The absence of such information increases the risks for incorrect legislation and/or implementation of standards. The logged data analysis on students' time of visit is indicative of time-independent access decisions. It means that students access the information and participate in the discussion forum in the virtual classrooms regardless of time. This time-independent accessibility of data and discourses is very useful for diverse purposes.

Though the net is a vast source of information that can support the development of strategies for biodiversity conservation, there is still a need to

create a highly structured venue where all learning transactions and discourses for biodiversity conservation can be done. It will be different if one can go directly to a place where needed information is more readily accessible than finding oneself surfing the net every time a data is needed. Or, it will be different if people can go directly to a place where they can find experts in the United States, Indonesia, Canada, or United Arab Emirates ready to answer their queries without the hassle of queuing for visas, or paying costly airfares. Through online learning, biodiversity conservation proponents may be able to establish global networks that could serve as important source of information and support (both technical and financial) (Bagarinao, 2011). In effect, virtual classrooms can become a low cost space to substitute for many real world activities, e.g. discussion in biodiversity conservation (Gregory 2009).

CONCLUSION AND RECOMMENDATIONS

The study focuses on the potential roles of virtual classrooms as experienced at UP Open University involving one of its master's programs in Environmental and Natural Resources Management. Both enrollment data and logged data of learners were mined and analyzed. Three learners' factors and connectivity pattern variables were computed and analyzed, and used in the identification of potential roles of virtual classrooms.

Results of the analysis indicate that the minimum age of the learners in the program is 18 years old while the maximum age is 66 years old. These learners represent four generations, and more than 60 provinces in the Philippines. Some of them are distributed in nearly 50 countries worldwide. Both male and female are nearly equally represented.

The results indicate that virtual classrooms can potentially create a venue for intergenerational discourses on biodiversity conservation, develop multi-cultural perspective on the issues in biodiversity, broaden potential impact areas or application areas of environmental concepts, reduce gender bias, and disseminate timely environmental information to impact areas. These potentials may justify the use of VCs in disseminating information that is necessary for the conservation of biodiversity.

The use of the three predetermined learners' variables may be limited in scope. Occupations, connectivity, income, and/or education may also have an impact in the analysis. These factors however were not included in the analysis due to the limited data. It is therefore recommended that these factors may also be analyzed. Data may be directly collected from a sample population through a survey.

The identified roles of virtual classrooms were extracted from the data analyzed. These roles however may be validated through triangulation to substantiate the analysis of this study. Due to time constraints, the study only focused on the potential roles of the virtual classrooms.

Since the study observed the behavior of learners in a required virtual classroom, the patterns of access may be different in a virtual classroom created for the purpose of conservation biodiversity discourses. It is recommended therefore that an experimental virtual classroom be developed, and the behavior of online participants be observed and analyzed.

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